

REMARKS/ARGUMENTS

Favorable reconsideration of this application in view of the above amendments and in light of the following discussion is requested.

Claims 4-8, 11, 13-15, and 18-32 are pending. **Claim 8 is amended as discussed during the personal interview** conducted on March 10, 2009. Support for the amendment to Claim 8 is self-evident. Support for new Claim 32 can be found in Fig. 8A, for example. Claims 4-7, 11, and 22-27 are withdrawn. No new matter is added.

In the outstanding Office Action, Claims 8, 13-15, and 18-20 were rejected under 35 U.S.C. § 103(a) as obvious over Koshiishi et al. (U.S. Patent Pub. 2003/0106647, herein "Koshiishi") in view of Kanno et al. (U.S. Patent No. 6,373,681, herein "Kanno"), Howald et al. (U.S. Patent No. 6,125,025, herein "Howald") and Moriya et al. (U.S. Patent Pub. 2002/0037652, herein "Moriya"). Claim 21 was rejected under 35 U.S.C. § 103(a) as obvious over Koshiishi, Kanno, Howald, Moriya, and Huang (U.S. Patent Pub. No. 2004/0005726, herein "Huang"). Claim 30 was rejected under 35 U.S.C. § 103(a) as obvious over Koshiishi, Kanno, Howald, Moriya, and Hasegawa et al. (U.S. Patent No. 5,556,500, herein "Hasegawa"). Claim 31 was rejected under 35 U.S.C. § 103(a) as obvious over Koshiishi, Kanno, Howald, Moriya, and Birang et al. (U.S. Patent No. 5,491,603, herein "Birang").

At the outset, Applicants note with appreciation the courtesy of a personal interview granted by Examiner Dhingra on March 10, 2009. In combination with the interview summary provided by Examiner Dhingra, the substance of the personal interview is substantially summarized below in accordance with MPEP § 713.04.

Regarding the rejection of Claim 8 as obvious over Koshiishi, Kanno, Howald, and Moriya, that rejection is respectfully traversed by the present response.

Amended independent Claim 8 recites, in part:

controller is configured to control a pressure of the heat transfer medium supplied from said heat exchange means and configured to change the pressure of the heat transfer medium supplied in accordance with each of multiple steps of the plasma process; and  
the controller is configured to set the pressure of the heat transfer medium to a non-zero level during conveying of the object into and out of said chamber so as to carry out cooling of said focus ring during conveying the object to be processed into and out of said chamber.

Accordingly, as discussed during the personal interview, Claim 8 is amended to recite that the controller is **configured to** control the pressure as specifically recited in Claim 8. For example, the controller is **configured to** set the pressure of the heat transfer medium to a non-zero level during conveying of the object into and out of said chamber.

During the personal interview, Examiner Dhingra indicated that a controller "configured to perform specific steps" would be given patentable weight, and Claim 8 is amended in accordance with the input Examiner Dhingra provided during the personal interview.

One benefit of the configuration recited in amended independent Claim 8 is that it is possible to prepare for the dry etching of a **second** wafer W, i.e. to more efficiently remove the heat from the focus ring (30) after processing the first wafer W, and thus make the dry etching conditions more uniform for all of the wafers W.

In contrast, Koshiishi describes changing a DC voltage applied to a wafer-attracting electrode (22) (paragraph [0057]).

Kanno describes that an electrostatic chuck has a structure in which a wafer mounting surface of the chuck is provided with a dispersion groove (col. 2, lines 49 to 59).

Howald describes reducing, as a function of time, the value of a voltage applied by a source (38) to a chuck (30) clamping a workpiece as a substrate (col. 15, lines 59 to 64), and controlling the source (38) to derive a sequence of time spaced decreasing step voltages during processing of glass (substrate) (col. 16, lines 7 to 9).

Birang describes controlling the pressure of an inert gas such as helium pumped against the bottom side of a semiconductor wafer (101) in respective processing steps (col. 7, lines 28 to 31 and 57 to 61).

Huang describes a heat transfer means (54) adjusting the temperature of a focus ring (52) (Fig. 3).

Moriya describes a computer (21) to which signals indicating various process conditions of the semiconductor substrate, such as the opening of a gate valve transporting the semiconductor substrate (Isolation Valve), the flow of helium for cooling (He flow rate), the electrostatic chucking voltage (ESC voltage), and the electrostatic chucking current (ESC current) are inputted (paragraph 0056, lines 13 to 26.)

Hasegawa describes placing and attaching an annular thin plate part (116) formed of tungsten, etc., which corresponds to an outer part (106) of a focus ring (102) on an outer circular surface of a base part (114) which corresponds to an inner part (104) of the focus ring (102) (col. 9, lines 51 to 60 and FIG. 6), and placing and attaching an annular thin plate part (124) formed of amorphous carbon, etc., which corresponds to the inner part (104) on an inner circular surface of a base part (126) of the focus ring (102) (col. 9, line 65 to col. 10, line 6 and FIG. 6). Hasegawa, in claim 1, discusses properties of a focus ring "so that said reaction product generated from said second surrounding surface diffuses to said major surface of said substrate **while said plasma is being generated**, thereby correcting a distribution of the amount of the reaction product on said major surface."

The outstanding Office Action acknowledges that Koshiishi, Kanno, and Howald do not disclose a controller that changes the pressure of a heat transfer gas supplied in accordance with multiple steps of plasma processing and controls the chuck voltage and

pressure of the heat transfer gas so as not to set these parameters to zero during conveying the object to be processed into and out of the chamber.<sup>1</sup>

Regarding the statement in the outstanding Office Action that Moriya teaches "*a controller that controls the pressure of the heat exchange gas and supply of chucking voltage to electrostatic chuck during all processing steps including during conveyance in/out of substrate...*," Applicants respectfully note that Moriya does not disclose a controller that is **configured to** cause the machine to supply a cooling gas and non-zero voltage when the substrate is transferred into and out of the chamber, even if the controller in Moriya may be modifiable. In other words, the controller described in Moriya does not provide the specific configuration of the controller recited in amended independent Claim 8.

Additionally, Applicants respectfully note that Moriya is directed to processing a substrate **while generating a minimum number of particles**. To achieve this goal, Moriya describes a suction pump and suction path capable of reducing a pressure within a suction path to a pressure that is lower than a pressure within the processing chamber during processing. Moriya is not concerned with cooling during transfer of a substrate into or out of a chamber, much less the effect created when a substrate is transferred into and out of a chamber while providing additional cooling to a focus ring.

Indeed, all the techniques of the above-noted references are based on the fact that a wafer (an object to be processed) stays inside a chamber and is being electrostatically attracted to a mounting stage (a susceptor).

In contrast, independent Claim 8 recites a controller **configured** to provide specific conditions during conveyance of the object to be processed into and out from the chamber.

If the temperature of the focus-ring were to change from a desired temperature during conveying the object to be processed into and out from the chamber, a desired process result

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<sup>1</sup> Outstanding Office Action, page 6.

would not be obtained in processing for the next object to be processed. To ameliorate this problem, in the apparatus recited in independent Claim 8, the chuck voltage and the pressure of the heat transfer gas are purposely not set to zero so as to adjust the temperature of the focus-ring to the desired temperature during conveying the object to be processed into and out from the chamber. The apparatus recited in Claim 8 takes into consideration not only the processing currently performed, but also processing to be performed next for an object which has not been conveyed into the chamber. The cited references merely take into consideration processing of a wafer which has already been conveyed into the chamber.

Each of Claims 13-15, 18-21, and 28-32 depend, directly or indirectly, from independent Claim 8 and patentably distinguish over any proper combination of the cited references for at least the same reasons as independent Claim 8 does.

For the foregoing reasons, it is respectfully submitted that this application is now in condition for allowance. A Notice of Allowance for Claims 8, 13-15, 18-21, and 28-32 is earnestly solicited.

Should Examiner Dhingra deem that any further action is necessary to place this application in even better form for allowance, Examiner Dhingra is encouraged to contact Applicants' undersigned representative at the below-listed telephone number.

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